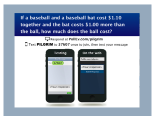
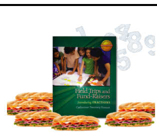
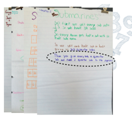
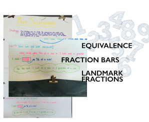
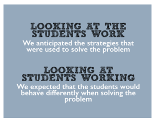
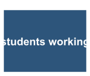
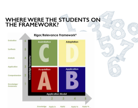
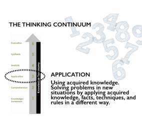
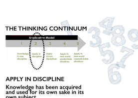
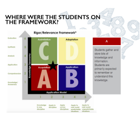
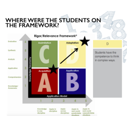
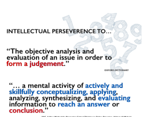
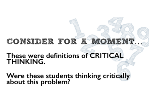
start the poll everywhere app before the slide show

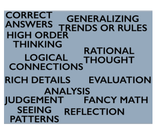
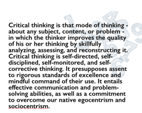
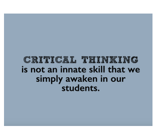
1 L		*[Slide is on the screen as people enter]*
2 L		*[Slide: Phones and Instructions]* Up on the screen you will see the instructions on sending a message using your phone to poll everywhere. Take a moment to get your technology out and get ready to answer a question. We have a quick ice-breaker question. Its not meant to be challenging or stress anyone - just a chance to do some math. *[Slide: transition to fade instructions]* Take a moment to read the question posted and text in a response. *[Slide: question to appear]*
3 L		*[Slide: Blue screen]* *[Slide: Names appear]* We are Lisa Pilgrim and Bridget Goodwin from Halton District School Board in Canada. *[Slide: Names appear]* Welcome to our presentation of *[Slide: Creating the Conditions for]* Creating the Conditions for *[Slide: Critical Thinking]* Critical Thinking
4 L		*[Slide: Blue screen]* Before we get into talking about how you may go about creating the conditions for critical thinking, we want to start with some context - this is the story behind the presentation. *[Slide: Where it all began]* From the beginning of our time in the classroom, we have always wondered about how to foster critical thinking in our students. Over the years we have tried a lot of different resources or implemented a number of different approaches - but there have been a few milestones along the way. One such milestone helped us to clarify our own thinking - this will be the focus of the first section of this presentation.
5 L		*[Slide: White screen with subs]* A few years ago, we were engaging in some problem solving in our middle-grade math classes back in Ontario. Hoping to develop our students' ability in using fractions, we chose to use the *[Slide: Green Booklet moves in]* Field Trips and Fundraisers resource from the Fractions, Decimals and Percents Contexts for Learning Kit (otherwise known as the Fosnot Kit). If anyone has used this resource, you will know that the problems are richly textured to help make student thinking visible and move student thinking forward.

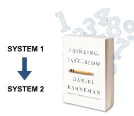
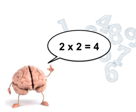
		The nuts and bolts of the problem is that children are going on a field trip and are given some submarine sandwiches to share amongst the people in their car. Students are given the information that there are 22 children on the trip and 17 subs available to eat. They are asked to determine how much sandwich each child on the field trip gets. If you haven't used a Fosnot problem in the past, the numbers chosen in the questions are purposefully selected to help give you a window into your students' thinking and abilities around fractions.
6 L		*[Slide: Blank screen]* On that note - let's take a look at some of the student work. *[Slide: Sheet #1]* On the first poster, we see 17 subs represented and divided into 4 equal pieces for sharing. Students are using the landmark fraction of one quarter. *[Slide: Sheet #2]* On the second poster, we again have our 17 subs. These students are able to work with both halves and quarters, consciously making fewer cuts to each sub. *[Slide: Sheet #3]* One the third poster, we're still working with 17 subs. This group cut each sub into thirds, distributed pieces to 22 people and repeated this process. Then, they attempted this process a third time. However, they abandon the last two and one-third subs when their plan couldn't be extended. *[Slide: Sheet #4]* The last piece of work talks through the process of moving between halves and quarters. We'd like to draw your attention to their final statement. [Click for transition.] Not knowing how to distribute the final two quarters, they took a more creative route of abandonment than our previous group. PIGEONS. All groups in the class felt that their work was complete, even though no group had distributed 100% of the subs. (Animal feed notwithstanding.)
7 L		So what was the problem? Is it a deficit in their knowledge of fractions? Let's take a closer look. *[Slide: Slides that show student work]* *Here is the group's summary of what they did.* *[Slide: Slides that show close up]* Students are using fraction bars [Slide: transition] to represent fractions, using a variety of landmark fractions [Slide: transition], demonstrating an

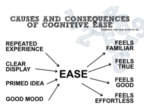
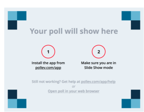
		understanding of equivalence [Slide: transition] because they are moving between halves and quarters “Good math” is happening, but something is missing.
8 L		*[Slide: Blue screen]* What were our expectations, what did we anticipate, and what was it that what we saw? *[Slide: Title slides in]* Looking at the students’ work, the strategies that students were using were what we anticipated. *[Slide: white text in]* This cohort of students hadn’t had quality opportunities to interact with fractions in past year so we thought that the majority of students would be fair-sharing fractional amounts of the subs. *[Slide: Title slides in]* Looking at the students working, *[Slide: white text in]* there were small group debates, they convinced one another of the strategies to use, they overcame problems and persevered to produce an answer.
9 L		*[Slide: appear]* *[Slide: blue box]* Something was missing *[Slide: expand]* and our guts told us it was something we were expecting while students were working. *[Slide: ?]* What was it? What was bothering us?
10 L		*[Slide: appear]* We considered the Rigor Relevance Framework. Where are these students on the framework?

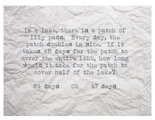
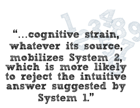
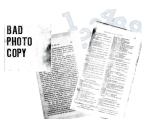
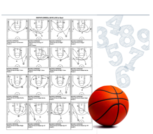
11 L		*[Slide: appear]* Thinking about the student work, we can see them applying their understanding of how to represent fractions as well as how to use landmark and equivalent fractions. *[Slide: circle]* *[Slide: text]* So we know they are in ‘Application’.
12 L		*[Slide: appear]* The knowledge that the students are using in this problem has been acquired for its own sake. *[Slide: circle]*

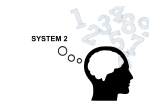
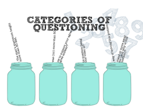
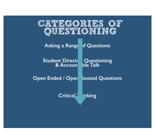
		[Slide: text] They aren’t considering the context of the problem and the real world connection that’s been provided to them… For them, this is a math class problem. Think of the disconnect between the answer that the students arrived at an the image of a 14 year old boy giving a piece of a sub to pigeons just to make it fair. We know they are at “Apply in discipline’.
13 L		*[Slide: appear]* Given the criteria, [*Slide: click for star]* we identify our students as being in the ‘Acquisition’ quadrant of the framework. [*Slide: click for definition]* This is not the ideal place for students to be.
14 L		*[Slide: appear]* [*Slide: click for star]* We would like our students to be at the ‘Adaptation’ level. [*Slide: click for arrow, click for star]* We would like students have the competence to think in complex ways and apply knowledge and skills they have acquired. Even when confronted [*Slide: click for definition]* with perplexing situations, we would like students to be able to extensively use what they already know to create solutions and take action that further develops them as mathematicians. So how are we going to get them there? What is the lagging skill? Let’s turn back to the students and think about what they were doing as they solved this problem.
15 B		*[Slide: appear]* We could not say that the problem was perseverance. The students worked for an extended period of time and reached what they saw as the end. *[Slide: transition in Red Judgment]* We wondered, however, about this judgement. *[Slide: transition in Red Conclusion]* Was this a reasonable conclusion? *[Slide: 2 clicks for transition in Full definitions of both]* And as we continued to consider what we had anticipated but had not observed, more things came to mind. *[Slide: 5 clicks for transition in Red turns to blue]*
16 B		*[Slide: appear]* Consider for a moment…*[Slide: text appear]* Those were definitions of critical thinking we’ve just provided you.

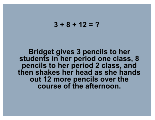
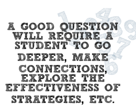
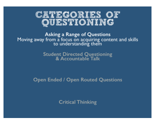
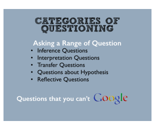
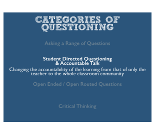
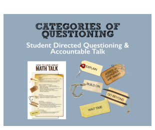
		[Slide: text appear] Were the students thinking critically about the submarine sandwich problem. We are going to pause for a moment and ask you to think: **Do you think that the students were thinking critically?** (Wait time...Wait time…10 seconds) When you considered if you saw or inferred evidence of critical thinking, did you go back to a definition of what critical thinking was? (BIG pause) Were you able to clearly identify for yourself markers of critical thought? (BIG pause)
17 B		*[Slide: appear]* As we began to discuss critical thinking, we discovered that most people were more comfortable with talking about what it wasn't. *[Slide: 2 clicks for title appear]* Most teachers, with a high degree of confidence, can identify an absence of critical thinking but when asked to define it, the responses were as varied as the people themselves.
18 B		*[Slide: 12 clicks for text to appear]* Here are some of the things that people thought were the indicators of critical thinking or the big ideas that should be understood within the definition.
19 B		*[Slide: appear]* It should come as no surprise that the definition that resonated with us the most was rather long…*[Slide: click for definition to appear]* When you take a detailed look, there are a lot of key ideas in this definition. [Slide: 4 clicks for text underlining. Give 30 seconds for audience read.]
20 B		*[Slide: appear]* Our big realization was not what critical thinking meant to us, however, it was that we realized in that moment that *[Slide: text appear]* **critical thinking is not an innate skill**. We need to provide opportunities for students to see critical thinking, understand what it is, and practice it often, so that this becomes something that they do. You may wonder how we arrived at the conclusion that it is not an innate skill. There were several key factors. The entire class left food on the table. There were several students who were proficient in their use of fractions and so this was an unexpected end point. Additionally, this is a class where many students have progressed in math slower than what a teacher may have

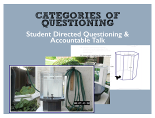
		traditionally anticipated and so they had had fewer opportunities to engage with rich problem solving where they may have used critical thinking in the experience.
21 L		*[Slide: appear]* *[Slide: click for blue box]* The math that these students had had the opportunity [*Slide: transition box expand*] to engage with had allowed them to become [*Slide: click for text*] cognitively frugal. Now, before you think that I am lauding insults at the poor pigeon-loving students, this term is used by Dr. Daniel Kahneman and meant to describe a default brain setting. (Nobel prize awarded by showing that people frequently fail to fully analyze situations where they must make complex judgments.)
22 L		*[Slide: appear, with only the book showing]* This is an image of his New York Times Best Seller “Thinking Fast and Slow” in which he writes about his research into people’s thinking. *[Slide: transition, medal appears]* He was awarded the Nobel Prize for showing that people frequently fail to fully analyze situations where they must make complex judgments. *[Slide: transition, medal disappears]* *[Slide: transition, brain appears]* Our fundamental design allows for being cognitively frugal. The human brain is a busy place and is constantly working to minimize its use of resources. Because of this, the typical, or default, setting with which we operate is one where we are attempting to negotiate the world around us with as little cognitive power as possible while still negotiating effectively. Kahneman describes the default or automatic setting as system 1. *[Slide: transition, system 1 appears]* The thinking we often want from our students, however, *[Slide: transition, arrow appears]* happens in system 2. *[Slide: transition, system 2 appears]*
23 L		*[Slide: appear]* We are using System 1 when we have a gut reaction to something or the answer just “pops” into our heads. *[Slide: transition speech bubble]* Take the problem 2 x 2 for instance… Did you need to think about this to know the answer? This is a comfortable system 1 calculation to perform. (BIG pause) Most of the time system 1 runs the show and does a good job of it.

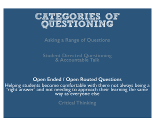
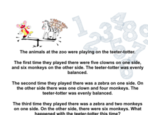
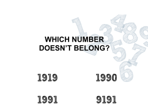
24 L		*[Slide: appear]* The problem is that we need to go beyond what system 1 can access, and are sometimes let down by system 2. Because one of the main goals of system 2 is to lessen the demand that the tasks being performed take, system 2 can gravitate towards key words, familiar patterns, associations, or other clues that provide an answer without utilising the greater cognitive load which it has available. Even if it means grasping at straws, system 2 would rather not work. *[Slide: transition, 4 key terms appear on slide*] When solving a problem, if there exists a repeated experience, the display of information is clear, you have been primed with the content or a portion of idea… even if you are in a good mood, system 2 will feel a sense of *[Slide: transition, click slide for EASE*] cognitive ease and is more likely to accept the suggestions *[Slide: transition, click slide for arrows)* of system 1 as *[Slide: transition, click slide for words*] familiar, true, good, and of course effortless.
25 L		*[Slide: appear]* Hey, remember that question you answered at the beginning of this whole thing? Let's take a look at your responses to the baseball question. Most, if not all people in this room are capable of performing the mathematics required to solve this question, and yet not everyone was able to answer correctly… but there is a reason for that. Dr. Daniel Kahneman discusses the fact that 50% of Harvard students fail this test in a written format. He points out that most people do not go back and check their thinking here. An idea came to mind from system 1 (that of $1.00) and system 2 endorsed it because an association came to mind (you were asked about $1.00 and the price included $1.00 so most people subtracted it). Take a moment and think about it. If the baseball bat cost $1.00 it would be 90 cents more than the ball. Why didn't we all answer correctly - or more importantly...
26 L		*[Slide: appear]* What didn't happen? The answer - any further thinking than necessary to come up with an answer that "felt" right. Think of our teacher questions: Does that make sense? Is that answer reasonable? How do you know you're right?

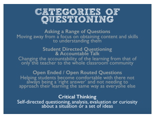
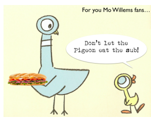
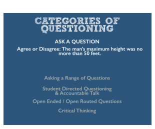
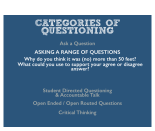
		System 2 is fully capable of answering any of these but won’t expend the energy if it isn’t used to doing so. To System 2, it looks like a whole lot of unnecessary work to do and so it decides to stick with system 1’s suggestion and is able to continue to be lazy. The good news is, we know that there are ways to get System 2 to snap out of it.
27 B		*[Slide: appear]* We can trick system 2 into doing a better job… Dr. Kahneman looks at the results of a Princeton study based on Shane Frederick’s Cognitive Reflection Test (CRT), a test where people tend to answer questions with the first idea that comes into their heads. *[Slide transition: clear text]* In this study, one set of students saw the questions on clearly printed paper. *[Slide transition: clear text away]* The other half were presented with [*Slide transition: crumple paper appear*] small fonts in washed-out grey print. [*Slide transition: bad text appear*] 90% of students with the clearly printed question made a mistake, however, only 35% of students made a mistake when presented with the less legible questions.
28 B		*[Slide: appear]* Performance is better with the bad font because of something known as “cognitive strain”. [*Slide transition: Cognitive strain quote*] “cognitive strain, whatever its source, mobilizes System 2, which is more likely to reject the intuitive answer suggested by System 1.”
29 B		*[Slide: appear 1, 2, 3*] Making a practice of handing out poor photocopies isn’t realistic, but we can’t sit back and rely on system 2 to complete the rigor of thinking that is required of it as an automatic default. How do we push System 2 to do some work? How do we move past the default of cognitive frugality.
30 B		*[Slide: appear]* The same way that we improve at most other things; purposeful practice and training. For example, *[Slide: transition in ball*] athletes practice moves and sequence of plays until they are automated. Students, or more generally, people need to practice accessing system 2 regularly as a first step in overcoming the limitations of our default cognitive settings.

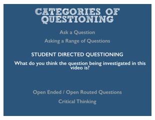
31 B		*[Slide: brain appear]* Helping students in developing the capacity to access system 2 [*Slide transition: appear text System 2*] in an increasingly effective way, requires accessing system 2 not just regularly, but also deeply. [*Slide transition: Click to Scale the words*] Past the point where it defaults to relying on familiarity, relationships and associations. We want system 2 to get used to some hard work.
32 B		*[Slide: appear]* In the spirit of the Marathon on Monday, [*Slide: transition in words]* think about this as a "couch to 5km" for the brain. *[Slide: transition in arrow]*
33 L		*[Slide: appear]* So how do we adjust our teaching practices to regularly access system 2? We examined the scope of questions that we engage our students in and considered the demand on system 2. The questions could be organized into categories by the way that they promote activity within system 2. [*Slide: transition in words for 4 jars & baseline title - 7 clicks*] Moving towards critical thinking requires understanding where the default thinking lies - not just your students' thinking, also your teaching. Then purposefully then pushing past relying on suggestions from system 1 in order to activate and fully engage system 2 as you increase the demand level at each category of questioning.
34 L		*[Slide: appear*] Of course, you may be wondering: how do you know where your teaching is at? We can think of what our students say in class as a mirror for our teaching. *[Slide: transition in mirror]* If your teaching and questioning is at a low cognitive demand *[Slide: text appear]*, then the responses from the students, their thinking and answering, will also be at a low cognitive demand. *[Slide: 2 clicks transition text through mirror]* Consider the quality of answers that you hear. Not the correctness of those answers, but what we might call the visible thinking. Are you satisfied with this level of thought?
35 L		*[Slide: Categories of questioning title appear]* We want to move students beyond acquiring skills simply for the sake of doing so. We want them to develop a deeper, conceptual understanding of content and skills. Each of the these categories of questions [*Slide: 4 clicks for categories of questioning*] accesses System 2 at a deeper and more meaningful level, thus [*Slide: arrow appear*] providing students the opportunity to increasingly think more critically.

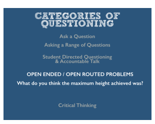
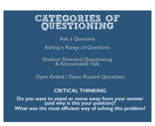
36 L		*[Slide: appear]* Let's look at the following addition question. [*Slide: math question appear*] We can present this as a simple, traditional algorithm or we can develop a scenario [*Slide: math problem appear*] to encourage students to use problem-solving skills. The amount of effort required of a student increases in the scenario question, but this effort is not mathematical. There is no increase of mathematical thinking and also no new opportunity for critical thinking.
37 L		*[Slide: appear]* We want students to not only think, but to think <u>deeply</u>. *[Slide: text appear]* Students need to develop the capacity to make mathematical connections, evaluate effectiveness, judge quality and outcome, etc.
38 B		*[Slide: appear]* So our first category of questioning is Asking a Range of Questions *[Slide: text appear]* We spend a lot of math class in answer mode… what is the sum, the product, the result, the area, the solution. What kind of thinking is required of students to respond to these requests? Consider a student who understands the skill or content you are focusing on. System 1 suggests something, system 2 endorses it, and the student raises their hand.
39 B		*[Slide: appear]* To promote student thinking, we need to slow down the endorsement by system 2 - have it sit on the question and do a little work. What do we as teachers do to provide the opportunity for this? *[Slide: 7 clicks for types of questions appear]* We seek to ask a variety of questions that will encourage critical thinking. We go beyond easily answered or *[Slide: click google]* "Googleable" questions.
40 L		*[Slide: Student directed questioning & talk appear]* It is often our goal as classroom teachers to help students develop their capacity for rich, mathematical discussions. We need to try and take ourselves out of the spotlight and serve as facilitators for these discussions. *[Slide: transition in descriptor]* We need to move the responsibility for the questioning and talking about the math from teacher to student. This is the next level deeper into the capacity of System 2.
41 L		*[Slide: appear]* Here is an anchor chart we created to help scaffold the development of mathematical discussions in class. *[Slide: 5 clicks for math talk tags appear]* It provides a foundation for students on how to explore beyond "What answer did you get?" and engage in a more vigorous debate and deliberation.

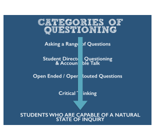
<table>
<tr>
<td>42
L</td>
<td>
</td>
<td>[Slide: appear]
We have also looked to the work of Dan Meyer who takes a typical textbook question [Slide: white question appears] and develops an investigation for students, presenting only the most basic information, [Slide: blurred white question appears] Dan Meyer creates a media experience for students, [Slide: 2 clicks for photo appears] which we encourage you to explore on his webpage, Dan Meyer’s 3-Act Math Tasks.

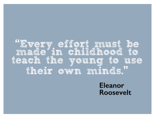
An experience like this forces students to consider the mathematical situation more deeply: ‘What information do I have?’
‘What information would be helpful?’
‘What is the question that I am responding to?’
Presenting all the information to students in the manner to which they’ve become accustomed generally leads them to make predictable System 2 endorsements. When we purposefully restrict and reserve information in order to access System 2 more meaningfully, we promote deeper and more critical thinking.</td>
</tr>
<tr>
<td>43
B</td>
<td>
</td>
<td>[Slide: Critical Thinking title appear]
Taking away some of our default limitations on questions, and presenting situations that have multiple points of access, or multiple answers, places an even greater demand on System 2. [Slide: white question appears]
Questions without a pathway limitation are called open-routed and questions without a predetermined outcome are called open-ended. System 2 must now grapple with either multiple paths or multiple possible solutions to an inquiry.
By moving the focus away from simply obtaining an answer, especially ‘the correct answer’ and instead resolving to help students develop a personalized approach provides a powerful opportunity for critical thinking.
When students stop doing what they believe they are expected to do, they start engaging in mathematics as sense-making.
Let’s take a look at a couple of examples of these open routed and open ended problems before moving on.</td>
</tr>
<tr>
<td>44
B</td>
<td>
</td>
<td>[Slide: teeter-totter problem appear]
The teeter-totter problem is an open routed problem because it allows students to select and utilize a variety of different strategies. In an effective open routed problem, there is no best or most correct pathway towards the solution.</td>
</tr>
<tr>
<td>45
B</td>
<td>
</td>
<td>[Slide: year numbers problem appear]
This second problem is open-ended. All students start on the same pathway - they all must determine the criteria for the three ‘belonging’ numbers so that they can provide a rationale for excluding the fourth number. While there are many solutions that are less rigorous mathematically such as 9191 doesn’t belong because it is the only year that hasn’t happened, there is no final most correct response.</td>
</tr>
</table>

46 L		*[Slide: Critical Thinking title appear]* Lastly, we look at questions or investigations specifically designed to engage students' critical thinking skills. *[Slide: Critical Thinking descriptor appear]* These are tasks requiring students to create and respond to their own questions, analyze, synthesize, or evaluate information or even pursue their own mathematical curiosity.
47 L		*[Slide: Pigeon sub appear]* Let's turn back to the pigeons for a second. If we had been cognisant of these categories of questioning and purposefully taught with them as a lens through which to view engaging students in thinking and questioning before the Submarine Sandwich problem, our belief is that the students would have let the pigeons go hungry. They would have been unsettled with the leftovers and would have better scrutinized their process and solutions. Since purposefully engaging students in these categories of questioning, we have witnessed students who capably reexamine their thinking, are prepared to adjust, revise or create a new plans of attack, and possibly even discover why their originally selected strategies were ineffective.
		[Slide: Critical Thinking definition appear] Through self-directed, self-disciplined, self-monitored thinking and self-corrective thinking, critical thought that is only possible deep within System 2, students have the opportunity for a more meaningful mathematical experience even when solving the same question.
48 L		*[Slide: appear]* Here's a look at how you could take a math problem and adjust how you use it in class to help your students develop System 2 capacity with the same starting point, we can pose questions that require increasingly greater cognitive demand. You do not need to reinvent the wheel in order to move deeper in System 2 As a model we will use the Blob Jump Questions from the Agree or Disagree website.
49 B		*[Slide: Ask a question title appear]* At the lowest level of demand, we begin with a question framed to elicit a simple response: agree or disagree. *[Slide: white text appears] "The Man's maximum height was no more than 50 feet"*
50 B		*[Slide: Asking a range of questions appear]* As we develop the questions, students are encouraged to support their answer and to seek to persuade other dissenting students. What begins as an argument will develop into debate and discussion. *Questions such as: [Slide: white text appears]*

<table>
<tr><td></td><td></td><td>“Why do you think it was (no) more than 50 feet?” or [Slide: white text appears] “What could you use to support your agree or disagree answer?”
will help generate this quality of discussion.
Students consider and reconsider what they think to be correct, but may reconsider their position as they work to justify their response and when they discover the responses that run counter to their own ideas.</td></tr>
<tr><td>51
L</td><td>
</td><td>[Slide: Student-directed questioning appear]
Student directed questioning reveals a level of deeper thinking. When other prompts or directions are stripped away, students are required to consider what knowledge or information they have at their disposal and what the logical inquiry would be.

After watching the video, prompting students with:
[Slide: white text appears] “What do you think the question being investigated in this video is?” Will move their thinking immediately into System 2 as they engage in reflective consideration of the mathematics they know and how it connects to the information they just consumed.
Idealy they will also consider what additional information they may need or what new learning needs to happen to reach an answer to their question.</td></tr>
<tr><td>52
B</td><td>
</td><td>[Slide: Open ended/open routed appear]
Open-ended or open-routed problems allow for greater student exploration.
[Slide: white text appears]
Open-ended problems like this one, “What do you think the maximum height achieved was?” leads students on an inquiry where more than one answer may be reasonable based on a student’s process, support, or argument.</td></tr>
<tr><td>53
L</td><td>
</td><td>[Slide: Critical thinking appear]
We often share our work in a Bansho or Congress format to allow for rich and meaningful discussions of the mathematics being investigated or used.
At this stage, a question such as [Slide: white text appears] “Do you want to stand or move away from your answer?” prompt students to reflect on their work and internally justify their solution.
Pushing them forward, we might also ask “What was the most effective way to solve this problem” to continue to have the student critically examining the mathematics.

Through self-directed, self-disciplined, self-monitored, and self-corrective thinking they may use System 2’s full power in order to evaluate the efficacy of their body of knowledge and problem solving work.</td></tr>
<tr><td>54
L</td><td>
</td><td>Our belief is that if you start by asking a range of questions, foster student directed questioning and accountable talk, engage students in open ended and open routed problems, provide frequent opportunities for the students to engage in the critical thought that they are capable of, then you will cultivate a</td></tr>
</table>

		community of learners who are no longer cognitively frugal, but are capable of a natural state of inquiry.
55 L		

Sherry Parrish: https://www.youtube.com/watch?v=twGipANcIqg
57:35 Logical Mathematical Knowledge vs Social Knowledge (Piaget)
Letting it come from them - not telling